MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2016/2017

DCS5058 – OPERATING SYSTEMS

(DIT & DBIS)

1 JUNE 2017
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 7 pages with **2** sections.
2. Answer **ALL** questions.
3. Write your answers in the answer booklet provided.

Section A: Fill in the blanks (Total: 20 Marks)

Instruction: *Fill in the blanks with the terms given in the table.*

system call	registers	I/O protection	resources	blocked
directory structure	time quantum	User File Directory (UFD)	victim	program counter
program codes	operating system	logical address space	no preemption	global memory
shared memory	partitioning	physical address space	process control block	control is returned to the monitor
control is passed to a job	dispatch latency	fixed partitioning	interrupt	Master File Directory (MFD)

1. _____ is a program that controls the execution of application programs.

2. A computer is a set of _____ for the movement, storage, and processing of data.

3. It is called as _____ when the processor is fetching and executing instructions in a user program.

4. Device controller informs CPU that it has finished its operation by causing an _____.

5. After the interrupt is serviced, the saved return address is loaded into the _____.

6. In asynchronous I/O, _____ will be used to request operating system to allow user to wait for I/O completion.

7. In message passing communication model, data can be communicated among a set of processors without the need for _____.

8. In order to ensure that a user program could never gain control of the computer in monitor mode, _____ is required.

9. Two essential elements of process are _____ and a set of data associated to it.

10. Upon the creation of a new process, a _____ will be created by the operating system in order to manage the process.

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11. The principal design issue with round robin is the length of the _____ to be used.

12. The time it takes for the dispatcher to stop one process and start another running is called as _____.

13. Deadlock can be defined as a set of _____ processes each holding a resource and waiting to acquire a resource held by another process in the set.

14. Four conditions are necessary in order for a deadlock condition to occur which are mutual exclusion, hold-and-wait, _____ and circular wait.

15. Main memory and _____ are only storage that CPU can access directly.

16. _____ is a memory management technique in bringing processes into main memory for execution by the processor without involving virtual memory.

17. Virtual memory will be able to have a larger _____.

18. Page replacement is required to prevent over-allocation of memory. Page replacement will search for a free frame. If there is no free frame, page replacement algorithm will be used to select a _____ page.

19. The file system consists of two parts, which are the collection of files and _____.

20. In two level directory, each user has its own _____.

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Section B: Structured Questions, 4 Questions (Total: 80 Marks)

QUESTION 1 (20 Marks)

a. Operating system will evolve over time due to hardware upgrades and user demand for new services. List **FOUR (4)** stages in the evolution of an operating system. (2 Marks)

b. Differentiate between *tightly coupled system* and *loosely coupled system* in a multiprocessor computer system. (4 Marks)

c. Briefly explain the storage hierarchy in **Figure 1** in terms of speed, cost, volatility and capacity. (4 Marks)

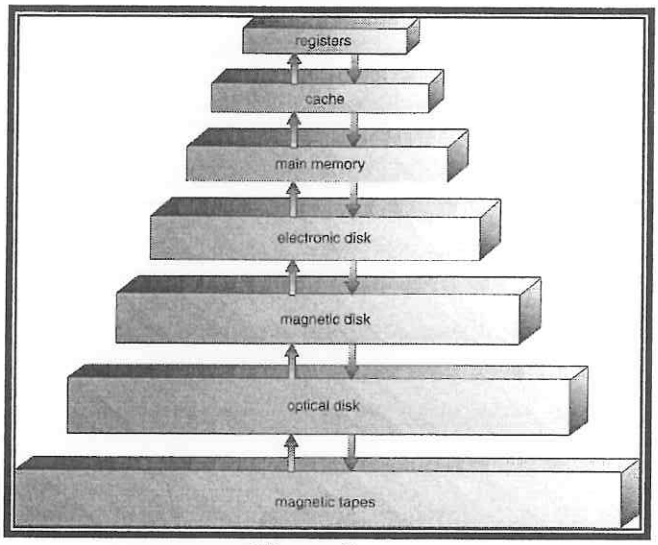


Figure 1

Continued...

d. Name **TWO (2)** I/O structures (a) and (b) shown in **Figure 2**. (2 Marks)

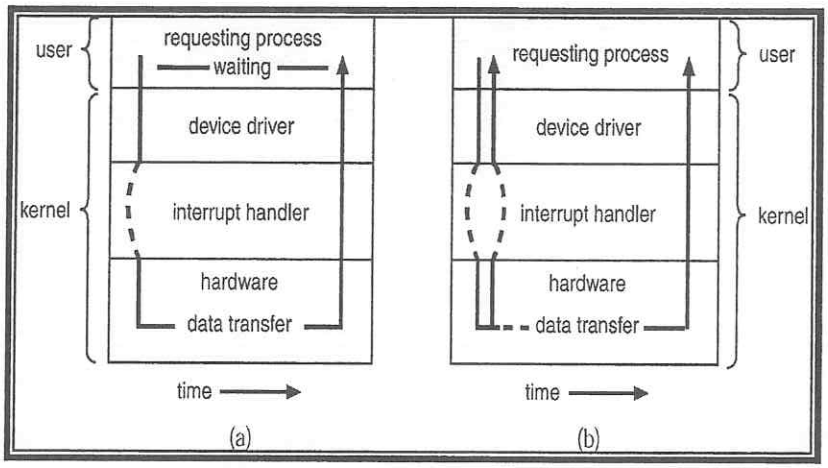


Figure 2

e. Based on the memory layout shown in **Figure 3**, calculate base register and limit register for Job B. (2 Marks)

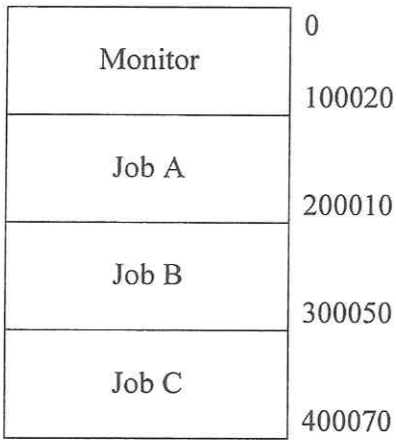


Figure 3

f. Describe layered approach structure. Give **ONE (1)** advantage and **ONE (1)** disadvantage for layered approach. (4 Marks)

g. System call is a programmatic way in which computer program request services from operating system. List any **TWO (2)** types of system call. (2 Marks)

Continued...

QUESTION 2 (20 Marks)

a. Why process control block is important in operating system management and how it accomplishes its objective? (4 Marks)

b. Explain any **TWO (2)** characteristics of a suspended process. (4 Marks)

c. Define multithreading. (2 Marks)

d. Differentiate between non-preemptive and preemptive decision modes. (3 Marks)

e. **Table 1** shows the processes with the length of the CPU burst time given in milliseconds. The processes arrived according to the arrival time.

Process	Arrival Time *(ms)*	Burst Time *(ms)*	Priority
P_1	10	5	1
P_2	5	6	1
P_3	3	8	4
P_4	0	9	2
P_5	7	5	3

Table 1

Draw Gantt Charts illustrating the execution of these processors using the following scheduling algorithms. Calculate the ***waiting time*** for each process and the ***average waiting time***.

i. Preemptive Priority (4 Marks)

ii. Non-Preemptive Shortest Job First (3 Marks)

Continued...

QUESTION 3 (20 Marks)

a. Explain *deadlock detection.* (2 Marks)

b. Consider a system with four processes P_1, P_2, P_3 and P_4 and three resource types: A (8 instances), B (14 instances), C (4 instances).

	Resource A		Resource B		Resource C	
	Max	Allocation	Max	Allocation	Max	Allocation
P_1	2	0	5	5	2	1
P_2	3	1	10	2	0	0
P_3	4	3	1	1	2	1
P_4	8	1	6	4	4	0

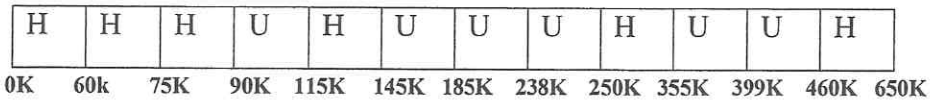
Table 2

i. Based on the requirements and current allocations given in **Table 2**. Calculate the available resources. (1.5 Marks)

ii. Determine the content of the matrix *Need*. (3 Marks)

iii. Determine if the above system is in a safe state. (3.5 Marks)

c. Given a heap of memory management scheme with the following free list:



* U - Used
* H - Hole

The following process request will be received in order as in Table 3:

Process Number	Size in Kilobytes
1	38
2	65
3	18
4	88
5	8

Table 3

Continued...

Show how the memory requests are allocated using the following memory allocation schemes.

i. First Fit (FF) (5 Marks)

ii. Worst Fit (WF) (5 Marks)

QUESTION 4 (20 Marks)

a. Consider the following page reference string:

p, p, q, r, s, s, u, t, r, u, s, r, p, q, r, p, q, u, s, r

Assuming a paging scheme with **FIVE (5)** frames is initially empty. Trace the allocation of pages to frames and determine the number of *page faults* occur using the following page replacement algorithms:

i. Optimal (5 Marks)

ii. First-In-First-Out (FIFO) (5 Marks)

b. Illustrate the two-level directory structure in file system. (3 Marks)

c. Differentiate between *user IDs* and *group IDs* in implementing file sharing for multiple users. (3 Marks)

d. Explain *contiguous allocation.* (4 Marks)

End of Page.